

What is claimed is:

- 1                   1.       A method of auditing a tension value in an installed  
2 threaded fasteners comprising:  
3                   providing an installed threaded fastener;  
4                   applying a torque to the threaded fastener until a torque is  
5 reached such that the fastener rotates;  
6                   measuring the torque values applied to the fastener and  
7 measuring the angle through which the fastener rotates;  
8                   creating a plot of the torque applied to the fastener against the  
9 angle through which the fastener rotates whereby the measured torque  
10 values are plotted on a torque axis and the measured angle values are  
11 plotted on a angle axis;  
12                  extending a tangent from the torque versus angle plot at a point  
13 where the fastener was rotating to the angle axis and defining the point at  
14 which the tangent crosses the angle axis to be zero degrees;  
15                  scaling the angle axis from the zero degree point based on the  
16 actual rotation of the fastener and measuring the angle of rotation from the  
17 zero degree point to the angle corresponding to the torque necessary to  
18 rotate the fastener; and  
19                  comparing the measured angle against a predetermined angle.
- 1                   2.       A method for comparing as in claim 1, wherein the  
2 applied torque is in the tightening direction.

1 3. A method of comparing as in claim 1, wherein the  
2 fastener is loosened to a breakaway torque.

1 4. A method of comparing as in claim 1, wherein the  
2 predetermined angle is determined by applying a torque to a similar fastener.

1 5. A method of comparing as in claim 1, wherein the  
2 predetermined angle is a design parameter.

1 6. A method of comparing as in claim 1, further comprising:  
2 replacing the installed threaded fastener if the angle corresponding  
3 the breakaway torque does not meet or exceed a predetermined value.

1 7. A method for installing a threaded fastener to a  
2 predetermined clamp load comprising:  
3 providing an angle of rotation value corresponding to a selected  
4 clamp force for a threaded fastener;  
5 applying a torque to the fastener until a predetermined torque  
6 value is reached;  
7 applying an additional angle of turn to the threaded fastener;  
8 measuring the torque applied to the threaded fastener after the  
9 predefined torque level and measuring the additional angle of turn and  
10 plotting the measured torque against the additional angle of rotation such  
11 that the torque is plotted on the torque axis and the angle is plotted on an

12 angle axis;  
13 extending a tangent from the plot to the angle axis and defining  
14 the point at which the tangent crosses the angle axis to be zero degrees;  
15 measuring the angle from zero degrees to the threshold level  
16 torque and comparing the measured angle against the provided angle of  
17 rotation value.

1 8. A method as in claim 7 wherein the threaded fastener is  
2 removed if the measured angle does not meet or exceed the provided angle  
3 of rotation.

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A1  
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